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GEODESY.—*The equilibrium theory of the earth's crust.* GEORGE R. PUTNAM. Washington, D. C.

It is now generally accepted that the crust, or outer portion of the earth, is in a condition of equilibrium, called isostasy. Under the great and continuous pressures exerted, the solid materials of which the crust is composed act to some extent as if they were plastic, and elevations are, so to speak, floated and depressions sunk by the relatively lighter or heavier materials of which they are composed or by which they are underlaid. I became interested in this subject over 30 years ago. So much has been written about isostasy since, that I would not feel justified in again recurring to this early work, were it not that, because of the way in which it was published, there has been some misapprehension regarding it.

The early work referred to was the measurement of the relative force of gravity made by me in 1894 and 1895 at 34 stations in the United States, and the statements of the results for these and other stations published in 1895 and 1896.[1] The field work was for the most part planned by Mendenhall, then head of the Coast and Geodetic Survey, and was the first extensive use of the portable pendulum apparatus developed under his direction, largely by E. G. Fischer. The stations were systematically distributed across the continent, at points well suited to bring out the general facts as to crustal conditions, including a station on the summit of Pikes Peak. I had the assistance of Charles Mendenhall, now of Wisconsin University, on the mountain part of this work.

While the task assigned me was to make the observations, in putting the results into shape, with reduction to sea level by the then cus-

[1] PUTNAM. Coast and Geodetic Surv. Report for 1894, Appendix No. 1, pages 9–37. 1895. Phil. Soc. Washington Bulletin **13**: 31–56. 1895. Amer. Jour. of Sci. **1**: 186–192. March, 1896.

tomary methods, one on the theory of a rigid crust, and the other a crude application of isostasy, I was impressed by the significance of this series, and by the fact that those two methods both signally failed to remove all the large anomalies, and that therefore neither gave clear evidence as to crustal conditions.

The idea of isostasy had been expressed by Airy in 1855, and by Pratt in 1859, as an explanation of anomalies in plumb line deflections in India, and was also advanced to account for the anomalies in gravity results from pendulum observations in India in 1865. In 1880 the French astronomer Faye[2] suggested that while elevations in general are in a condition of equilibrium, the gravity results would be more harmonious if certain features of moderate size were allowed for as supported loads, and he gave as illustrations the Great Pyramid of Egypt, a single hill or mountain, and the "pillar" of an oceanic island. He did not however apply this idea.

The so-called free air reduction was an attempt to apply a compensation correction to gravity observations by ignoring the attraction of all material above sea level. A comparison in 1895 of the resulting anomalies, with the topographic situations of the stations showed a striking relationship, with large positive anomalies where the stations were above the average elevation, and the reverse for stations below. So I applied a leveling off process, estimating the average elevation of the country about each station within an arbitrarily assumed radius of 100 miles, and then allowing for the attraction of the mass between the station elevation and the average elevation, subtractive or additive as the station was above or below the average. This in effect applied approximately an isostatic compensation sufficient for the average elevation of the region about a station, instead of for the station elevation itself. In application it simply added another term to the free air reduction. On the idea of isostasy, this was a logical procedure, as the trouble with the free air reduction was that it ignored the fact that gravity at any station is appreciably affected not only by the compensation immediately beneath that station but by the resultant effect of the compensation of the surrounding area for some distance, and in regions where the

[2] FAYE. C. R. Acad. Sci. 90: 1443. 1880. Because of the suggestion in this paper of allowing for certain supported loads, in 1895 I used the term Faye reduction. FAYE however never applied the idea or developed a formula. To avoid confusion which has arisen, and also because the reduction I developed is not dependent on the idea of supported loads, I have since called it the average elevation reduction, as it adds to the free aid reduction formula a term to allow for isostatic compensation for the average elevation of the region about a station.

point of observation was much above or below the average elevation the resulting over or under compensation was shown by the large free air residuals. In this investigation I used 67 stations, including previous determinations in several continents, and island stations in two oceans, a group of stations exceptionally well placed to throw light on isostasy. Quantitatively the method was effective, as for the first time in gravity reductions, the large residuals disappeared.

In 1909, after having tested the theory of isostasy by means of deflection of the vertical data, Hayford made an important advance by developing a method of reducing observations of the force of gravity taking account for the first time of the curvature of the earth's surface and of the compensation of all the topography of the earth.[3] He assumed a condition of perfect local isostasy, a depth of compensation derived from his deflection investigations and uniform vertical distribution of compensation. He reached important conclusions by comparisons of the anomalies with those of older methods. In this work he used 72 gravity stations, 56 of which are in the United States. The investigations were later greatly extended by him and by Bowie. They constitute the most thorough investigation that has been made of the bearing of gravity observations on the condition of the earth's crust, and they yielded gravity residuals which are probably more significant than any heretofore.

But it developed that the 1895 reductions had given anomalies on the average approximately as small as the later more rigid work. The reason for this was explained later. The investigations of Hayford and Bowie[4] have indicated that there is practically no difference between the average anomalies based on an assumption of perfect local isostasy and those based on an assumption of regional compensation, which implies some local rigidity, to a radius of 37 miles from the station, and it is not shown that the same may not be true for a somewhat larger radius. For an area included within a radius of 104 miles they concluded that there is a marked advantage for local isostasy. While there is probably close isostatic adjustment for areas smaller than this, the average anomaly differences are still rather small even to the radius of 104 miles, and there is a little additional evidence in favor of regional compensation to this limit, as for example that derived from neighboring pairs of stations.[5]

[3] HAYFORD. Report, International Geodetic Association, App. A: 365. 1909.

[4] HAYFORD and BOWIE. Coast and Geodetic Surv. Spec. Pub. **10**: 98–102. 1912, BOWIE. Coast and Geodetic Surv. Spec. Pub. **40**: 85–92. 1917.

[5] PUTNAM. Bull. Geol. Soc. America **33**: 299–301. 1922.

Therefore the results of the method used in 1895, which was equivalent to applying approximately an adjustment to each station to compensate for the average elevation of the surrounding region, are not affected by whether local features are considered as regionally supported loads or not. Within the limits of the approximations used the results should be similar to those by the Hayford method.

TABLE 1—COMPARISON OF GRAVITY ANOMALIES

STATION	STATION ELEVATION	AVERAGE ELEVATION WITHIN 100 MILES	ANOMALIES, g OBSERVED, LESS g COMPUTED			
			Bouguer reduction	Free air reduction	Average elevation reduction Putnam, 1895	Hayford reduction 1912
	meters	*meters*	*dyne*	*dyne*	*dyne*	*dyne*
Washington, D. C. (Smithsonian) Coastal region	10	0	+0.023	+0.024	+0.023	+0.039
Deer Park, Md. Allegheny Mts. ridge	770	479	−0.045	+0.032	+0.003	+0.010
Ithaca, N. Y. Lake region	247	345	−0.055	−0.031	−0.021	−0.023
Denver, Colo. Western plateau	1,638	2,212	−0.207	−0.048	+0.008	−0.016
Pikes Peak. Rocky Mt. summit	4,293	2,258	−0.231	+0.234	+0.014	+0.021
Grand Junction, Colo. Rocky Mt. valley	1,398	2,251	−0.184	−0.044	+0.041	+0.024
Norris Basin, Wyo. Rocky Mt. region	2,276	2,137	−0.197	+0.038	+0.024	+0.021
Salt Lake City, Utah. Western plateau	1,322	1,894	−0.171	−0.045	+0.010	+0.010
Mt. Hamilton, Calif. Coast mountain summit	1,282	80	−0.031	+0.093	−0.022	−0.003
San Francisco, Calif. Pacific Coast	114	−280	−0.009	−0.028	−0.039	−0.023
Seattle, Wash. Coastal region	74	530	−0.127	−0.135	−0.071	−0.093
Juneau, Alaska. Coastal valley	5	800	−0.039	−0.047	+0.046	+0.037
St. Georges, Bermuda. Atlantic Island	2	−2,400	+0.225	+0.214	−0.029	+0.020
Saint Paul Island, Alaska. Bering Sea Island	12	−60	+0.041	+0.032	+0.034	0.000
Honolulu, Hawaii. Pacific Island, coast	6	−1,930	+0.202	+0.192	−0.002	+0.054
Mauna Kea, Hawaii. Pacific Island, summit	3,981	−1,670	+0.252	+0.630	+0.076	+0.185
For 42 stations, range of anomalies			0.507	0.765	0.147	0.278
Mean, regardless of sign			0.104	0.068	0.025	0.024
For 25 United States stations, range of anomalies			0.278	0.316	0.086	0.062
Mean, regardless of sign			0.117	0.039	0.018	0.014

They do agree, on the average, to a degree which is rather unexpected when the generalizations of the 1895 reductions are considered, but as I pointed out, the methods of computation were too approximate for the individual residuals to have much significance. For the most part, however, they show the same trend as the Hayford anomalies.

Table 1 illustrates the foregoing by comparison of anomalies for stations significantly located, using the four reduction methods.

The summary at the end includes all stations for which a direct comparison of original results could be made. A full comparison, and explanation of the reductions, were published in 1922.[6] Most weight should be given to the United States stations, and these show a small but appreciable advantage for the 1912 results.

The 1895 investigation included 15 oceanic island stations in the Pacific and Atlantic Oceans and Bering Sea, and for these the weight of surrounding sea water, as well as the configuration of the sea bottom, was taken into account in computing the compensation due to average elevations.[7] The results for these oceanic island stations were in good conformity with those for the continental stations.

At the time, I stated[8] that the 1895 results indicated "that local topographical irregularities" are "maintained by the partial rigidity of the earth's crust," and I meant, by this, features of the order of a single mountain, as suggested by Faye. I did not conclude that mountain systems or larger continental areas are upheld, and I did not use the words "mountain ranges," which in this connection are ambiguous. The 1895 results furnished strong evidence of the existence of isostasy to a fairly close but not determined limit, but it has since developed that they did not furnish proof as to the support of local features. The results with the Hayford reduction method give very strong evidence of the correctness, to a close limit, of the theory of isostasy, but as shown above, for areas of 37 miles radius, or possibly larger, they give indeterminate results as between regional and local compensation. Such a feature as a single mountain would generally fall within an area of this size, and thus the gravity investigations do not determine whether a mountain is regionally supported or locally compensated. A mountain is in general undoubtedly compensated, but it is probable that through partial rigidity the compensation is distributed beyond the area of the base, as a part of the compensation of the surrounding region; the method of distribution is, for obvious reasons, difficult to detect with the pendulum. Visible evidence on the surface of the earth shows that the strength of its materials is sufficient to maintain for long periods nearly vertical rock walls of great height. It is highly improbable that there is such a condition of compensation below the surface as to support locally and separately the rock walls and the contiguous valleys of the Glacier Park region, for example, or the gorge and the side walls of the Grand Canyon of the Colorado.

[6] PUTNAM. Bull. Geol. Soc. America **33**: 291–299. 1922.
[7] PUTNAM. Coast and Geodetic Survey, Rep. 1894, App. No. 1; 26–29. 1895.
[8] PUTNAM. Coast and Geodetic Survey, Rep. 1894, App. No. 1; 25. 1895.

At the request of the Superintendent of the Coast and Geodetic Survey, Gilbert, a well-known geologist, took part in the 1894 work by making a geological examination of some of the stations, and he also later discussed the results with respect to isostasy.[9] His computations and conclusions were quite independent of mine, and I had no responsibility for them. While convinced of general isostasy, his conclusions as to the extent of regionally supported features were much broader than anything suggested by me, and in fact his discussion rather disregarded my warning that "it is probable that no particular significance attaches to these residuals remaining," and the fact also that I attached no significance to the arbitrarily selected radius for the average elevation about the station. His work, however, had the valuable effect of pointing the way to the interest of the gravity results to geology. Gilbert in a later paper[10] completely discarded his deductions of 1895, and I refer to them now only because the conclusions he discarded have inadvertently been ascribed to me.[11] Their publication at the same time without comment is explained by the state of knowledge at the time, and inexperience on my part.

Hayford wrote me a letter, March 11, 1922, which I would not quote but for its quite direct bearing on the purpose of this note. Referring to my paper of 1922,[12] he says: "In general I am fully in accord with it. It seems to me that what you did was to reach a close approximation, in 1895, to correct conclusions, based on evidence that convinced you but which did not at that time fully convince others. The fact that later, and much more abundant, evidence treated much more rigorously gives conclusions in such close agreement with those reached by you, emphasizes the validity of your work, and also strengthens the conclusions from the later work."

I have pointed out the superiority of the recent methods. The 1895 investigations, however, arrived at a fairly close approximation to the same results by a very simple computation method.[13] Be-

[9] GILBERT. Phil. Soc. Washington Bulletin **13**: 61–75. 1895.

[10] GILBERT. U. S. Geol. Surv. Prof. Paper **85**-C. 1913.

[11] BOWIE. Bull. Geodesique, **6**: 2. Memoir of Hayford. 1925. Scientific Monthly, **22**: 7. 1926.

In these two references there has been some misapprehension in stating my views, ascribable to the earlier manner of publication.

[12] PUTNAM. Bull. Geol. Soc. America **33**: 287–302. 1922.

[13] National Research Council. International Critical Tables. **1**: 1926. SWICK, *Variation of Gravity with Elevation*, page 402. Under "more exact methods" for computing the value of the acceleration of gravity at a point on the earth's surface, the average elevation method, similar to the formula developed in 1895, is given as follows: "In mountainous country, the computed value will be practically as close to the true

sides their interest historically, they have also a value, as mentioned by Hayford, in showing that similar conclusions as to general crustal conditions are reached by a quite different method of computation, and in indicating how a combination of approximate assumptions may yield results on the average quite close to those of the more elaborate method. There may be a tendency to take more literally even than their authors intend the truth of combinations of assumptions, the probability of which may appear to be indicated by the smallness of averages. For example, it is fairly obvious that there is no sharply defined depth of compensation, that the depth in which there is some compensation effect varies in different regions, and that there is not a uniform vertical distribution of compensation, these being assumptions that were made for mathematical convenience.

An impressive fact as to the earth is that all the varied features of its so-called crust are in a fairly close state of equilibrium, and a conclusive proof of this fact has been furnished by the study of the oscillations of the pendulum.

PETROLOGY.—*Rocks of Eastern China.*[1] H. S. WASHINGTON and MARY G. KEYES, Geophysical Laboratory, Carnegie Institution of Washington.

INTRODUCTION

Attention has previously been called to the paucity of our knowledge of the chemistry of the igneous rocks of China.[2] Of the igneous rocks of that country—with an area of one-half that of the United States—only about 25 analyses have been published, and few of these are of good quality and of fresh rock. In order partially to supply this deficiency, Dr. L. F. Yih, Director of the Geological Survey of China, at the request of the senior author, kindly sent him 24 specimens of the igneous rocks of eastern China from the Survey collections. For this kindness and courtesy we would express our hearty thanks.

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value as in flat country if an additional term is added to the right hand side of equation (1) (free air reduction), to take account of the elevation of the place above or below the general level of the topography within a radius of, say, approximately 160 km. For every 10 m. the place in question is above the general level, this term amounts to 0.001 cm./sec.^{2}, and for every 10 m. below the general level, it amounts to -0.001 cm./sec.^{2}. In computing the height of a coast station above the general level, the water must be considered replaced by an equal mass of rock, of average surface density, resting on the bottom of the ocean."

[1] Received May 6, 1926.

[2] CLARKE and WASHINGTON, U. S. Geol. Survey Prof. Paper **127**: 66. 1924.

The present paper aims only at giving petrographical descriptions and chemical analyses of the specimens at our disposal, the descriptions having been written by the senior and the analyses made by the junior author.

Literature. The literature on the petrography of China is not abundant. Of the more general works, that of Pumpelly[3] need not be considered, as it antedates the use of the microscope. Von Richthofen[4] in general names the rocks only from field observations, and he gives no detailed petrographical descriptions. Blackwelder[5] contributes a chapter on the rocks collected in northern and central China by the Carnegie Expedition of 1903–4, with many petrographical descriptions but without analyses. The rocks collected in northwestern and central China by the Futterer-Holderer Expedition of 1898 have been described by Andree and Schwartzmann, with a few chemical analyses.[6] Deprat[7] gives many descriptions, with some good analyses, of the rocks of Yunnan in southwestern China. Koch[8] describes the rocks of northern China collected by the Szechenyi Expedition, but without analyses.

Shorter papers are those by: Pabst,[9] who describes rocks of Kiangsi used in porcelain manufacture; Schwerdt,[10] who describes von Richthofen's specimens from Shantung and Liautung; Steuer,[11] who gives a few brief descriptions of granites from Kansu and Shensi; Lèvy and Lacroix,[12] who describe rocks from southern China; Rinne,[13] with good descriptions of rocks from around Kiau Chow in Shantung; Wong,[14] who deals with the petrography of Hsi Shan, west of Peking, in Chihli, Yih, describing the geology; and Norin,[15] who gives a good description of a syenitic area in western Shansi, some of the rocks of which we have analysed.

[3] PUMPELLY, Smithsonian Contrib. Knowl., **15**, 1867.
[4] VON RICHTHOFEN, China, **2**, 1882.
[5] BLACKWELDER, in Willis, Walcott, et al., Research in China, Carnegie Inst. Publ. No. **54**: 1 (2). 357–476, 1907.
[6] FUTTERER, Durch Asien, **2**, part 2, passim, 1909; 3, part 4, 61–116, 1911.
[7] DEPRAT, Mem. Serv. Géol. Indochine, No. 1 (1), 1912.
[8] KOCH, in Wiss. Ergeb. Reise Graf Bela Szechenyi, **3**: 364. 1899.
[9] PABST, Ztsch. deutsch. geol. Ges., **32**: 223. 1880.
[10] SCHWERDT, Ztsch. deutsch. geol. Ges., **38**: 198. 1886.
[11] STEUER, Neu. Jahrb. Beil. Band **10**: 478. 1895.
[12] LÉVY and LACROIX, C. R. Acad. Sci., **130**: 211. 1900.
[13] RINNE, Ztsch. deutsch. geol. Ges., **56**: 122. 1904.
[14] WONG, in Yih, Mem. Geol. Surv. China, No. **1**: 32. 1920.
[15] NORIN, Bull. Geol. Surv. China, No. **3**: 45. 1921.

PETROGRAPHY

Alaskite. The best specimen of alaskite is one from Chow Kow Tien, in Hsi Shan (Western Hills), in Chihli, a granite from which, poor in quartz, is described by Wong. Our specimen is white, rather fine-grained, composed almost wholly of white orthoclase and less quartz, with very few scales of biotite and small, opaque, black grains. In thin section the feldspar is seen to be uniformly a slightly turbid, untwinned soda-orthoclase, with abundant quartz, the texture being granitic. The very rare, small biotites are light yellow; there are some small, elongated crystals of colorless titanite, (mentioned by Wong as common in granite); a few magnetite grains, but no pyroxene. The black, apparently opaque grains, under high powers, are slightly transparent on thin edges, with a dark red color and marked pleochroism: they are referred to one of the sodic amphiboles, aenigmatite or cossyrite. Much altered specimens that appear to be alaskite, are those from Ma Shan, Chao Yuan Hsien,[16] Shantung, which is reddish and porphyritic, and may be the tsingtauite of Rinne or the rhyolite porphyry of Blackwelder; from Ssu Tze Shan, Hunan; and from Ki Ling An, Fan Chang Hsien, Anhui (Ngan Hwei), which is aplitic.

The chemical analysis (No. 1 of Table 1) is that of a somewhat sodic alaskite, with almost equal amounts of the orthoclase and albite molecules. The small quantity of sodium metasilicate shown in the norm obviously belongs, with the normative acmite and diopside, to the sodic hornblende;[17] while the small percentages of normative rutile and wollastonite go to form the titanite. The rock is clearly of sodic affinities.

Granite. Various kinds of granite are very abundant in China. Two specimens were studied. A *biotite granite* from Lai Yang Hsien, Hunan, is fine-grained, made up of white feldspar, quartz, and small biotites. The thin section shows a typically granitic texture. The feldspar is dominantly untwinned orthoclase, with less, finely twinned oligoclase; they and the quartz grains inclose a few small crystals of colorless titanite; the thickish tables of pale brownish biotite are fresh and clear. There are a few magnetite grains, but neither pyroxene nor amphibole is present. The chemical analysis of this specimen (No. 2 of Table 1) calls for no special remark, except that all the

[16] Hsien = district. Shan = mountain.

[17] This has been shown for the lavas of Pantelleria (Washington, Jour. Geol., **22**: 22. 1914).

normative hypersthene must enter biotite and, with the necessary amount of orthoclase and a little of the magnetite and ilmenite, thus forms about 15 per cent of this mica.

TABLE 1—ROCKS OF EASTERN CHINA*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
SiO_2	73.10	65.63	63.93	63.65	62.72	61.05	54.18
Al_2O_3	12.95	14.69	16.86	13.57	12.70	16.49	16.11
Fe_2O_3	0.60	1.30	2.78	0.64	1.21	1.01	3.62
FeO	0.60	3.01	1.22	1.68	1.71	3.97	4.68
MgO	0.22	1.58	0.67	3.61	3.44	3.00	5.00
CaO	0.66	2.97	4.33	5.15	4.85	5.61	8.40
Na_2O	4.90	3.23	5.42	4.90	5.25	3.09	3.92
K_2O	5.75	4.56	2.33	3.73	3.43	3.53	1.33
H_2O+	0.36	0.55	0.54	0.43	0.43	0.53	0.03
H_2O-	0.01	0.08	0.07	0.03	0.12	none	0.01
TiO_2	1.26	2.05	1.12	1.80	3.07	1.67	2.02
ZrO_2	n.d.	n.d.	none	0.02	n.d.	n.d.	n.d.
P_2O_5	0.05	0.19	0.37	0.17	0.45	0.14	0.12
S	n.d.	n.d.	0.03	0.05	n.d.	n.d.	n.d.
Cr_2O_3	n.d.	n.d.	none	0.01	n.d.	n.d.	n.d.
MnO	0.01	0.08	0.04	0.06	0.04	0.01	0.08
BaO	n.d.	n.d.	0.09	0.08	n.d.	n.d.	n.d.
	100.47	99.92	99.80	99.58	99.42	100.10	99.50

Norms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Q	25.02	20.70	15.66	9.54	9.12	13.20	4.20
Or	34.47	27.24	13.34	21.68	20.02	20.57	7.78
Ab	33.54	27.25	45.59	41.39	44.54	26.20	33.01
An	—	11.95	15.29	4.17	1.11	20.85	22.52
Ac	1.85	—	—	—	—	—	—
Ns	1.34	—	—	—	—	—	—
Di	1.30	1.76	2.59	15.98	15.77	4.94	14.52
Hy	—	4.36	0.50	1.60	1.30	8.94	8.02
Wo	0.70	—	—	—	—	—	—
Mt	—	1.86	4.18	0.46	—	1.39	5.34
Il	1.22	3.95	2.13	3.50	3.65	3.19	3.80
Hm	—	—	—	0.32	1.28	—	—
Ru	0.64	—	—	—	1.12	—	—
Ap	—	0.34	0.34	0.34	1.01	0.34	0.34

(1) Alaskite, I′.4.1.3. Chow Kow Tien, Hsi Shan, Chihli.
(2) Biotite granite, I(II).4.2′.3. Lai Yang Hsien, Hunan.
(3) Augite granite, I(II).4′.2′.4. Shang Ch'ien Pu, Wu An Hsien, Honan.
(4) Quartz syenite porphyry, II.(4)5.1(2).′4. Chin Ling Ch'in, Shantung.
(5) Quartz syenite porphyry, II.(4)5.1.4. Tien Shan, Ih Tu Hsien, Shantung.
(6) Granodiorite, II.4′.3.3′. Hsiao Chi Sheh, Lung Jen Hsien, Fukien.
(7) Andesine andesite, II′.5.3.4′. Hsi Ma Ho, Mongolia.

* MARY G. KEYES, analyst.

A specimen from near Shang Ch'ien Pu, Wu An Hsien, Honan, is an *augite granite porphyry*. This is light gray, with small (2–4 mm.) phenocrysts of dull, slightly pink feldspar and small prisms of black augite in a very fine-grained but phaneric groundmass. Microscopically, the phenocrysts of orthoclase are fairly euhedral, stout crystals, with rough outlines and somewhat turbid in the interior. A few phenocrysts of oligoclase also occur. The rough prisms of augite are of a pale, slightly greenish, yellow. The fine-grained groundmass is typically granitic. Magnetite grains are few, and there is no biotite, amphibole, or titanite. The chemical analysis (No. 3 of Table 1) shows that the rock is decidedly sodic and that the amount of quartz is not large.

Quartz syenite porphyry. Two specimens that fall here come from Chin Lin Ch'in and from Tien Shan, Ih Tu Hsien, both in Shantung. They resemble each other so closely in all respects that the two localities probably are near each other or belong to the same petrographic district. They are fine-grained, aplitic-looking rocks, with small phenocrysts of white feldspar and some of black augite, in a very fine-grained, phaneric groundmass. Both specimens contain small dark xenoliths of pyroxenite. The thin sections show short, thick tables of fresh, considerably twinned microcline, with little quartz. The augite phenocrysts form stoutish, ragged prismoids, of a pale, brownish yellow color, and are not very fresh. The groundmass is granitic, composed of some quartz and more turbid feldspar. Neither specimen contains biotite, amphibole, or magnetite grains, but in that from Ih Tu Hsien there are some small crystals of colorless titanite. The chemical analyses of the two specimens (Nos. 4 and 5 of Table 1) are much alike and show that the feldspar is a sodic microcline or a potassic albite.

Biotite granodiorite. Only one specimen, from the southeasterly province of Fukien, represents this rock, but it would appear to be fairly abundant in eastern China, to judge from the descriptions by Koch and by Blackwelder. The rock is rather fine-grained, with granitic texture, made up of much fresh feldspar, many small scales of black biotite, and a little quartz. The microscope shows that the abundant feldspar is in part multiply twinned andesine, about Ab_3An_2, with less untwinned orthoclase. The thick tables of rather dark brown biotite carry no inclusions; there are few crystals of light yellowish augite, slightly altered, but no amphibole. Grains of magnetite, some of them arranged in branching aggregates of octahedra, also occur. The chemical analysis (No. 6 of Table 1) is distinctly quartz

monzonitic in character, with a marked sodic tendency—hence the name granodiorite rather than quartz monzonite, following Lindgren and Iddings.

"Basalt." Three specimens of basaltic lavas were studied by us, two of which proved to be olivine basalt and the third andesine andesite, using the nomenclature proposed by Iddings,[18] and adopted by one of us for the Hawaiian rocks.[19] According to this scheme, in the andesites the normative feldspars are dominant over the femic minerals, while in the basalts the amounts of each group are about equal. An andesite or a basalt may or may not contain modal olivine.

An *olivine basalt* from T'ang Shan, Ch'i Shia Hsien, Shantung, is black, densely aphanitic and wholly aphyric. The thin section shows rather numerous, small, equant, microphenocrysts of fresh olivine, in a very fine-grained groundmass, made up of grains of magnetite and smaller granules of colorless augite in a colorless glass base. Feldspar is almost wholly lacking and must be occult in the glass base. No analysis was made of this basalt. Basalts, of this and other kinds, would appear to be rather plentiful in the peninsula of Shantung, according to the descriptions by von Richthofen, Schwerdt, Rinne, and Blackwelder.

A basalt from Hsueh Hau Shan, Tsing Ching Hsien, Chihli, is medium gray, aphanitic and aphyric, with a few, small, irregular vesicles of the aa form. It is apparently not quite fresh, and was not analysed. Microphenocrysts of olivine are fewer than in the preceding specimen and they are all considerably altered to a yellow substance. The microgroundmass contains many small, thin laths of andesine, grains of magnetite, and granules and minute prismoids of colorless augite, in a colorless glass base. It is possible that this "basalt" is strictly an andesine andesite, as is that next to be described.

There is one specimen of "basalt" from Hsi Ma Ho, Mongolia, a river which we cannot find on the maps available, but which is presumably near the Chihli border. Von Richthofen (pp. 381, 389, 739) states that in eastern Mongolia there are extensive flows of "basalt," which here, as in Shantung, are said to overlie "trachytes" and "rhyolites." Our specimen is medium gray, almost aphanitic, except for very small feldspar laths in a dense gray groundmass. There are numerous, small, irregularly angular cavities, which contain small tables of labradorite. The microtexture is intersertal, the rock being made up of rather thick, much twinned, plates of andesine,

[18] IDDINGS, Igneous Rocks, **2**: 21. 1913.
[19] WASHINGTON, Amer. Jour. Sci., **5**: 469. 1923.

about Ab_3An_2, some small and altered, roundish grains of olivine, and fewer of fresh, pale gray augite. No magnetite grains are present, but there is considerable interstitial, dusty, brownish glass. The chemical analysis (No. 7 of Table 1) is that of an andesite, rather than of a basalt, in the usual acceptation of the terms. Its norm shows some excess SiO_2, as is true of many such rocks, in spite of the modal presence of olivine, which belongs presumably to an early stage of crystallization, in accord with the so-called Bowen-Andersen effect.[20]

Syenite area of Shansi. At Tzu Chin Shan, in western Shansi, Lat. 38°14′ N. and Lon. 110° 51′ E., is an area of syenitic rocks, which have been described by Norin,[21] who, however, gives no analyses of them. The igneous body is regarded by Norin as a laccolith. The igneous rocks are: "trachy-andesite" (phyric hornblende monzonite?), augite syenite, nephelite syenite, and aegirite-nephelite syenite, with tinguaitic dikes; a volcanic neck of brecciated syenite, cemented "trachyte," has broken through at one side. Our specimens are of augite syenite, nephelite syenite, and leucite tinguaite.

The *augite syenite* is fine-grained, showing many small prismoids and grains of black pyroxene scattered through finely granular alkalic feldspar. The thin section shows that the texture is granitic, and that the rock is composed very largely of untwinned, slightly turbid, anorthoclase, with less, somewhat tabular, finely twinned albite or oligoclase-albite. There is very little nephelite, mostly as small rounded grains, included in the feldspars. The pyroxene forms subhedral prismoids, which are pale yellowish brown, with a slightly greenish tinge. It is faintly pleochroic, from pale olive green to pale greenish yellow, with extinction angles up to 40°, and apparently contains a small percentage of the acmite molecule. There are fewer small, rounded and mostly equant grains of a dark red, almost opaque, hornblende, some of which are included in the augite. In our specimen they are so opaque that little definite can be said of them, except that they are a sodic hornblende which closely resembles that which is present in the alaskite of Chihli. According to Norin, the hornblende is monoclinic, with an extinction angle of 10°–12°, and he refers it to barkevikite, which, however, in our experience is usually much lighter in color and less reddish. Norin states that titanite "occurs abundantly," but none of this mineral was observed in our section, nor did we note any magnetite grains, which Norin mentions as also occurring. The chemical analysis of our specimen is given in

[20] BOWEN and ANDERSEN, Amer. Jour. Sci., **37**: 487. 1914.
[21] NORIN, Bull. Geol. Surv. China, No. **3**: 45. 1921.

TABLE 2.—ROCKS OF SHANSI

	(1)	(2)	(3)	(4)	(5)	(6)
SiO_2	55.38	56.40	53.75	50.00	51.93	52.91
Al_2O_3	15.47	19.74	18.71	20.03	20.29	19.49
Fe_2O_3	3.77	2.15	4.60	0.98	3.59	4.78
FeO	3.46	1.04	0.56	3.98	1.20	2.05
MgO	2.20	0.21	0.03	0.69	0.22	0.29
CaO	6.65	2.93	1.11	3.41	1.65	2.47
Na_2O	4.77	2.75	5.43	8.28	8.49	7.13
K_2O	5.11	12.42	12.64	8.44	9.81	7.88
H_2O+	0.36	0.33	0.78	1.50	0.99	1.19
H_2O-	0.03	0.28	0.07	0.10	0.10	n.d.
TiO_2	1.96	1.52	1.61	0.99	0.20	none
P_2O_5	0.36	0.14	none	0.21	0.06	trace
SO_3	n.d.	n.d.	0.25	n.d.	0.67	n.d.
Cl	n.d.	n.d.	0.14	trace	0.70	0.53
MnO	0.11	0.08	0.13	0.50	trace	0.44
BaO	n.d.	n.d.	0.01	none	0.09	n.d.
	99.63	99.99	99.82*	99.87†	100.58‡	100.25§

Norms

	(1)	(2)	(3)	(4)	(5)	(6)
Or	30.02	70.06	33.92	28.91	31.97	46.70
Ab	34.06	—	—	—	—	14.15
An	5.84	4.45	—	—	—	—
Lc	—	2.62	31.83	16.13	20.28	—
Ne	3.41	12.78	13.62	30.39	26.98	22.72
Hl	—	—	0.23	—	1.17	0.82
Th	—	—	0.43	—	1.14	—
Ac	—	—	13.40	2.77	10.63	—
Ns	—	—	0.49	2.56	0.12	—
Di	11.88	1.08	—	12.94	4.77	2.75
Wo	3.83	3.25	2.32	—	1.16	3.83
Ol	—	—	—	1.23	—	—
Mt	5.57	—	—	—	—	6.96
Il	3.80	2.13	1.52	1.82	0.46	—
Hm	—	2.15	—	—	—	—
Ru	—	0.40	0.80	—	—	—
Ap	1.01	0.34	—	0.67	—	—

(1) Augite syenite, II.5.(1)2.3″. Tzu Chin Shan, Lin Hsien, Shamsi. KEYES analyst.

(2) Nephelite syenite, I(II).6.1″.2. Tzu Chin Shan, Lin Hsien, Shansi. KEYES analyst.

(3) Pseudoleucite tinguaite, II.7.1.2. Tzu Chin Shan, Lin Hsien, Shansi. KEYES analyst.

(4) Pseudoleucite tinguaite, II.7(8).1.3. Beemerville, New Jersey. WOLFF analyst. U. S. Geol. Surv. Prof. Paper 99, 577, 1917.

(5) Pseudoleucite tinguaite, "II.7(8).1.3. Bearpaw Mts., Montana. STOKES analyst. U. S. Geol. Surv. Prof. Paper. 99, 577, 1917.

(6) Pseudoleucite tinguaite, (I)II.6.1.3(4). Magnet cove, Arkansas. WILLIAMS analyst. U. S. Geol. Surv. Prof. Paper 99, 553, 1917.

* Includes ZrO_2 none, Cr_2O_3 none.

† Includes CO_2 0.22, FeS_2 0.54.

‡ Includes CO_2 0.25, F 0.27, SrO 0.07.

§ Includes S 0.52, X 0.48, SrO 0.09.

No. 1 of Table 2. Some of the normative ilmenite presumably exists in the sodic hornblende, which is usually rather high in titanium.

The *nephelite syenite* of the area is regarded by Norin as intermediate between the augite syenite and the aegirite-nephelite syenite. According to him, the nephelite syenite is very variable in character, both texturally and modally, and he thinks that these syenites are schliere-like "differentiation products from the augite syenite magma." Our specimen appears to differ from what Norin describes as "a representative type." It is pale gray and somewhat phyric, showing thick-tabular phenocrysts of alkali feldspar, in a medium-grained, granitic-textured base, composed of gray feldspar, some flesh-colored nephelite, irregular spots of a black mineral with sub-metallic luster, and a few small scales of biotite. The thin section shows no features of special interest as regards the feldspar, which is a slightly turbid anorthoclase, and the much less abundant nephelite, the latter being fresh. None of the pyroxene, mentioned by Norin, appears in our sections, but there is a little brown biotite. Norin mentions that biotite is abundant when pyroxene is subordinate and vice versa. The megascopically black areas resolve themselves, in thin section, into clusters of small grains of a yellow-brown, isotropic mineral, with high refractive index; this is evidently the spinel spoken of by Norin. We could detect no titanite, which Norin says is abundant. The results of the chemical analysis of our specimen are shown in No. 2 of Table 2. This is remarkable for the high content in alkalies, especially in potash; giving rise to a small amount of normative leucite, which is taken up by the modal nephelite. The subrang, I.6.1.2, in which the rock falls, is as yet unrepresented by any analysis, so that this subrang, I.6.1.2, may be named *shansose*.

As we have no specimens of the aegirite syenite or of the "trachyandesite," the reader is referred to Norin's paper for descriptions of them.

Pseudoleucite tinguaite. Our specimen of this, the only representative of the many kinds of (mostly tinguaitic) dikes in the area, belongs to Norin's first type of "leucite tinguaite porphyry." It shows rounded or sub-angular phenocrysts of pseudoleucite, up to 1.5 cm. in diameter, in a greenish black, densely aphanitic groundmass. It can be seen by the naked eye that the pseudoleucites are composed of two minerals, a finely granular, grayish white feldspar, and pale flesh-colored nephelite, the latter occurring mostly in the interior of the crystal aggregate. Under the microscope, the large pseudoleucites show the usual aggregate of orthoclase and rather

less nephelite grains. No leucite could be detected, although Norin notes the presence in his specimens of a clear, colorless, isotropic mineral, with low refractive index, which he thinks is analcite, but which may be leucite. In the pseudoleucites are needles of aegirite and a few bundles of slender needles of natrolite. The holocrystalline groundmass is made up of very small anhedral grains of orthoclase and nephelite, irregularly sprinkled with very slender needles of aegirite, which are so thin that the individuals appear to be black, although the more crowded, felt-like areas show a greenish tinge. No sodic hornblende was seen nor was there found any of the sodalite group of minerals, although the chemical analysis indicates that very small amounts of some of these are present, as they are in other pseudoleucite tinguaites.

The chemical analysis (No. 3 of Table 2) shows about the same very high percentage of K_2O as does the nephelite syenite, but with less SiO_2 and twice as much Na_2O. As there is no, or at most very little, modal leucite, the normative leucite is to be considered as split up, forming modal orthoclase and potassic nephelite, in accordance with Bowen's interpretation of the composition of nephelite, based on laboratory study of the end members.[22] The high Fe_2O_3 is connected with the abundant aegirite, into which enters also the small amount of sodium metasilicate shown in the norm.

The Chinese rock closely resembles, modally and texturally, the pseudoleucite tinguaites of Bear Paw Mountains, Montana,[23] and of Beemerville, New Jersey.[24] The analyses of these two (Nos. 4 and 5 of Table 2) are much like that of the Chinese rock, except for the higher K_2O and lower Na_2O of the last. All three are also alike in that their norms show notable amounts of the leucite molecule, although no modal leucite is discernible in thin sections. The Chinese tinguaite falls in the subrang II.7.1.2, while the other two are in II.7.1.3. All three have a little sodium metasilicate in the norm. It may be recalled that both Pirsson and Wolff were cognizant of this excess of Na_2O over that needed for albite, nephelite, and acmite. Pirsson attributed this, in great part, to sodalite and nosean, which are present in the rock; but Wolff found difficulty in explaining it, as the New Jersey rock contains no sodalite, so that he somewhat doubtfully assigned it to aegirite. The pseudoleucite tinguaite of Magnet Cove[25] is also similar to these three modally and

[22] BOWEN, Amer. Jour. Sci., **43**: 115. 1917.
[23] WEED and PIRSSON, Amer. Jour. Sci., **2**: 194. 1896.
[24] WOLFF, Bull. Mus. Comp. Zool., **38**: 273. 1902.
[25] J. F. WILLIAMS, Ann. Rep. Geol. Surv. Arkansas, **2**: 267. 1891.

texturally, but its analysis (No. 6 of Table 2) shows slightly higher SiO_2 and lower Na_2O and K_2O, so that the norm contains none of the leucite molecule, and no leucite is present in the rock. All the known pseudoleucite tinguaites are connected with nephelite syenite and similar rocks, some of which they much resemble chemically, as the Chinese tinguaite resembles the accompanying nephelite syenite.

Summary. The specimens at our command are too few to give a very satisfactory idea of the general characters of the magma underlying eastern China, but the results of their study, taken in connection with the descriptions by others, allow us to form a general notion. The igneous rocks of the region are mostly granitic and granodioritic, true dioritic and gabbroic rocks being rare, and syenitic rocks even rarer. The common occurrence of effusive basalt, much of it with andesine, and of andesite (the "trachyte" of Richthofen and others), with some rhyolite, and the apparent absence of alkalic trachyte, phonolite, and tephritic lavas, also indicates that the general magma is decidedly silicic and of distinctly medium composition. Although many of the plutonic rocks have a decidedly sodic cast, yet the occurrence of nephelite syenite and other such very sodic rocks appears to be exceptional; they being known only in Shansi and in southern China, as has been noted by Lèvy and Lacroix. In connection with this latter occurrence it may be noted that the jadeite of Upper Burma is regarded by Bleeck[26] as a metamorphosed nephelite syenite, as was suggested earlier by Pirsson[27] for the jadeite of Tibet.

ETHNOLOGY.—*Piscataway royalty: a study in stone age government and inheritance rulings.*[1] W. C. MACLEOD, Wharton School, University of Pennsylvania. (Communicated by JOHN R. SWANTON.)

1. THE PISCATAWAY OVERLORDSHIP

The Piscataway were an Algonkian tribe or nation whose village was located originally in Maryland, at the junction of Tinker's and Piscataway Creeks, some fifteen miles south of the present city of Washington. The name Piscataway is also used to denominate the group of tribes, each with its own head chief or "king," over which the "king" of the Piscataway tribe ruled as overlord or "emperor." The Piscataway overlordship or "empire" embraced lands stretching for

[26] BLEECK, Rec. Geol. Surv. India, **36**: 254. 1907.
[27] PIRSSON, Amer. Jour. Sci., (4), **1**: 401. 1896.
[1] Received April 15, 1926.

130 miles from east to west in the Potomac River valley, north of the river; south of the river was the domain of Powhatan, "emperor" of the tidewater Virginia tribes.[2] About 1634 under the Piscataway overlordship were the tribes—and their kings—called Chingwawataick, Nangemaick, Mattowomans, Potopaco, Sacayo, and Pangayo. An archival note of 1666 would indicate the inclusion, at least at that date, of the Mibibiwomans and Masquetend; and also, but certainly very doubtfully, of the Anacostia of the District of Columbia and the Nanticoke groups, the Choptico and Doags. The Anacostia in 1631 were noted as being under the protection of the tribes of the upper reaches of the Potomac River, and warring on the Potomac tribe; the "protectors" of the Potomac tribe were also warring on the Piscataway.[3] But by 1666 there had been a serious decline in the native population, and some adjustment of sovereignties and alliances. By 1666, moreover, the same delegate, Mattabone, represented both the Piscataway tribe and the Sacayo tribe in conference with the English, which suggests that the Sacayo were losing their tribal identity; at this time the Pangayo and the Chingwawataick appear to have coalesced.

The Piscataway empire was clearly organised much after the pattern of that of Powhatan. Each tribe was constituted of a village and its suburbs or hamlets, under a tribal king who was subordinate to the king of the ranking tribe.

The Piscataway organization appears to have been no recent formation. In 1660 representatives of the component tribes explained for the benefit of the governor of the province or colony of Maryland in conference that their first emperor had come from the Eastern Shore of Maryland, historically Nanticoke country, thirteen generations before. That this first emperor had ruled over all the tribes or villages of what in 1660 was the colony of Maryland (the tidewater). They named "every town separately;" but the Proceedings of Council does not make record of the list. It is implied that then the Nanticokes were subject to the Piscataway emperor; and it is stated that in that day the historic enemies of the Piscataway,—the Potomac and the Susquehannock,—were subject to the Piscataway.[4] This last statement we may imagine may be mere boast on the part of the Piscataway. Thirteen generations would carry the Piscataway geneology back to perhaps 1540 A.D.

[2] See BRINTON, *Walam Olum*, pp. 226–227.
[3] FLEET, pp. 25, 30; SMITH, *General History*, Book 4: 377, 378.
[4] Council of December 20, 1660.

In 1639 the English Jesuits arrived in Maryland to missionize the Indians, under the patronage of Lord Baltimore. In that year they established a mission at the "metropolis of Pascatoe," the town of the Piscataway tribe; but in 1642, due to the war of aggression by the Susquehannocks, they had to move their station down river to Potopaco. Father White was the head of the Jesuit mission. As we shall see it is likely that the missionaries had some influence in the politics of the natives. Further European influence came shortly when the Piscataway agreed with the colonial government that their native political offices should require ratification by the colonial governor in order to be valid.

2. MATRILINEAL INHERITANCE OF OFFICE

Piscataway inheritance appears to have been similar to that obtaining in Powhatan's empire south of the river.

Powhatan, emperor of the tidewater Virginia tribes, in the course of an address to John Smith, said that the heirs to his imperial office in order of preference according to native law were (1) his three brothers, (2) his two sisters, (3) the daughters of his two sisters. Apparently his two sisters had no sons, for John Smith writes that sisters' sons were preferred to sisters' daughters. Powhatan emphasized the fact that *primogeniture also was the rule;* an elder brother succeeded in preference to a younger brother; but preference was for male heirs, so that a younger brother would follow his elder brother before any sister of the brother could succeed. Our data on the Piscataway is not so explicit, but nevertheless indicates that exactly the same rulings held; and it furthermore shows us *that a sister's daughter, even though only a child, would be preferred in succession to chiefship before any cousin of the former incumbent.* These matrilineal, primogenitural rulings apparently were general among the tribes of the southeast of North America, and are *exactly* similar to the inheritance preferences prevalent among the mother-sib tribes of northwestern North America, save in the case perhaps of the Tahltan of the plateau who seem to have preferred male cousins to sister's daughters.[5]

[5] SMITH, *Relation*, pp. 52, 115; and *Description*, p. 165. SMITH adds that office never descends to heirs of the brothers of the incumbent. Compare Anonymous, *A Relation of Maryland*, p. 84, 1635. MACLEOD, *Natchez Political Evolution; Aspects of Northwest Coast Social Organisation;* and LAWSON, *Carolina*, p. 318. MORICE (p. 142) notes among the Carrier Indians of the Northwestern plateau, that if there are no brothers, sisters, or sisters' children to succeed to the chiefship, the nephew, or even the niece of the mother of the deceased, that is, a cousin on the mother's side, might succeed.

The first "emperor" of the Piscataway line, circa 1540 A.D., was succeeded by his brothers, in turn, and the last of these was succeeded by a sister's son of the eldest brother, "and so on, from brother to brother, and for want of such, to a sister's son," on down to the period of the arrival of the English circa 1600.[6] The ruling sovereign when the English arrived was Kittamaqund. This emperor had slain his brother Wannas," to the end that he might enjoy the crown by the right of their succession, *brother always succeeding brother till they all be dead.*"[7]

Among the other tribes of the upper Chesapeake region and of the eastern shore we have a number of annotations referring to boy kings and emperors, with regents acting for them pending their maturity; and notes also of queens or female rulers.[8]

3. THE QUESTION OF THE SIB

We must now emphasize the fact that for the Piscataway (as for their neighbors) we have recorded *virtually no note of inheritance rulings save those applying to the office of king or civil head chief*, and that matrilineal inheritance of the chiefship is not in itself evidence for matrilineal inheritance of property, nor of the existence of the mother-sib. Among the Chitimacha of Louisiana it is found associated with the father-sib; and among the Yuchi who formerly dwelt on the plateau back of Virginia, it is associated with the mother-sib, but also with patrilineal societies; while among the Natchez it is associated with a form of patrilineal inheritance of rank.

The presence of matrilineal chiefship, however, indicates, in all likelihood, at least the influence of the mother-sib. The north-eastern Sioux of the Virginia highlands and plateau apparently possessed the mother-sib. Of these plateau peoples Lederer noted in 1671 that:

> From four women, viz., Pash, Sepoy, Askarin, and Maraskarin, they derive the race of mankind; which they therefore divide into four tribes, distinguished under these several names. They very religiously observe the degrees of marriage, which they limit not to distance of kindred, but difference of tribes, which are continued in the issue of the females; now, for two of the same tribe to match, is abhorred as incest, and punished with great severity. Their places of burial they divide into four quarters, assigning to every tribe

[6] Council of December 20, 1660.

[7] Council of May, 1662; compare above.

[8] Compare, for example, WHITE, *Brief Relation*, p. 41; *Jesuit Letters*, pp. 124–125, 136; and above.

one; for, to mingle their bodies, even when dead, they hold wicked and ominous.[9]

This is clearly an attempt by one not trained in ethnology to describe the mother-sib. To the northeastern and southeastern Siouan, the Algonkian of the tidewater were indebted for much of their material and social culture and it may be that the mother-sib had been borrowed.

4. HISTORICAL DATA ON THE PISCATAWAY DYNASTY

In 1640 the Piscataway emperor was Kittamaqund. In that year he and his family were converted to Catholicism by the Jesuits. In 1641 Kittamaqund died. Subsequently an Indian delegation to the English authorities stated that he had "died without brother or sister, and appointed his daughter to be queen." This daughter was a Catholic, one of two daughters of the deceased emperor; she was his favorite daughter. The Indians refused to assent to this breaking of the matrilineal rule of inheritance of office.[10]

From the time of this event, in the history of the first emperor to rule during the period of European influence, there appears to have been frequent irregularity in the inheritance of the office. To make this more comprehensible we will first outline something of the chronology, as it appears in the archival records.[11]

[9] The quotation is from LEDERER, p. 8.

On the inheritance of property we have a note by SPELMAN included in John Smith's compilations. The note very likely refers to Potomac River tribes. SPELMAN describes death and burial and then observes: "What goods the party leaveth is divided among his wives and children. But his house he giveth to the wife he liketh best, for life; after her death, unto what child he most loveth." This indicates patrilineal or bilateral property inheritance (ARBER's edition of SMITH; SPELMAN, p. CX).

On the possibility of the sib: An observer included in Smith's works noted for the Accohannock of the Eastern Shore that "In their marriages, they observe a large distance, as well in affinity as consanguinity." Properly affinity refers to relationship by marriage, but an observer without understanding of the sib may have misunderstood sib relationship for affinity. (SMITH, *General History*, p. 355.)

On the "significance of matrilineal chiefship" see MACLEOD, *Chiefship*, 1923. On the significance of Lederer's note for the sociology of the Sioux of the Plains compare SWANTON, *New Light*. On the general cultural relationships of eastern Siouan groups and the eastern Algonkian see SPECK, *Ethnological Position*.

[10] Council of May, 1662; and *Letters of the Jesuits*, p. 126. In these letters, surprisingly enough, for the year 1641 we read of this daughter as "the young empress" (pp. 132, 135–136); and it is in these also that we read of the wife and two sons of "the Tayac," Tayac being the native term for emperor, and referring to Kittamaqund, very likely.

[11] The extermination of family lines by disease was no doubt disturbing inheritance at this period (compare MACLEOD, *Chiefship*, p. 497). Still, we read, (Council of December 20, 1660) that the first emperor was succeeded by his brother "*since* he died without issue." This "since" however is very clearly a misunderstanding on the part of the interpreter. (My italics.)

1. UTTAPOINGASSENEM:[12] the first emperor, *circa* 1540 A.D.
2. QUOKENASSUM:..... brother of the foregoing, *circa* 1550 A.D.

Eleven unrecorded emperors follow, then:

14. KITTAMAQUND:..... *died, 1641.* This emperor had slain his elder brother Wannas, (also spelled Uwamno) in order to secure himself the throne. Kittamaqund died without "lawful heirs,"—that is, brother, sister, or sisters' children. He wanted his daughter to succeed him, but the tribe refused this. Instead they chose as his successor[13]
15. WEGHUCASSO:..... (spelled also Wahocasso, and Walmcasso), who was a descendant of one of the brothers of the first emperor, Uttapoingassenem, who had succeeded to Uttapoingassenem's office. Weghucasso *died in 1658.*[14] He was apparently himself without heirs for he was succeeded by another
16. UTTAPOINGASSENEM:. another descendant of one of the ancient emperors. This Uttapoingassenem *died in 1662*,[15] after a short reign of four years. He was succeeded by
17. WANNASAPAPIN:..... who is reported as the son of the Wannas who should have succeeded before Kittamaqund but who was slain by his brother, who succeeded instead. Wannasapapin died within one year, *in 1663.*[16] He was succeeded by
18. NATTOWASSO:..... who was the son of Weghucasso (no. 15, above); Nattowasso changed his name and took that of his father, Weghucasso. Nattowasso *died circa 1670.*[17]

The Weghucasso, who succeeded Kittamaqund, the native councellors told the governor of Maryland, was descended "from one of the brothers of the first emperor, which one, they knew not." Upon his death, Weghucasso "appointed" another "descendant of one of the first kings" to succeed himself.[18] This is rather puzzling; *suc-*

[12] Council of May, 1662, and *Jesuit Letters*, p. 123; and references cited above.

He was called Uttapoingassenem "inasmuch as he did, as it were, embrace and cover them all," that is, rule over all the tribes of Maryland. See Council of December 20, 1660.

[13] Councils of December 20, 1660, and May, 1662, p. 45.

[14] Council of February, 1658.

[15] Council of May, 1662.

[16] Council of June, 1663.

[17] Councils of May, 1662, and of June, 1670, p. 289.

[18] Councils of December 20, 1660, and of May, 1662, p. 453.

The title for king among the Piscataway we do not know; the title for emperor was Tayac, cognate with Nanticoke Tallak, head chief. In the 1660 council we read concerning Uttapoingassem II, successor to Weghucasso, that he was to be called Jan Jan Wizous, "which, in their language, signifies a true king, and [they] would not suffer us to call him Towzin, which is the style [title] they give to the sons of their kings;" *and the narrative continues to explain that sons may never inherit their father's office.*

cession to office by descendants of the deceased encumbant's brothers is not matrilineal. And succession by Weghucasso's son and by Wannas' son, is frankly patrilineal, just as was the succession of himself by his daughter determined on by Weghucasso's predecessor, Kittamaqund.

5. A PUZZLING ROYAL WEDDING

In the case of Nattowasso a puzzling situation is presented which, if it is ever wholly unravelled, will no doubt serve to illuminate social organisation in this region.

Nattowasso was a mere boy, eleven years old, when he succeeded. He died when he was about eighteen. Remembering Kittamaqund's killing of his brother, and the short one-year reign of Wannasapapin, son of the murdered Wannas and predecessor of the son of Weghucasso, we may suspect a quarrel for the office of emperor, especially so in view of the fact that on ratifying the Indian's choice of their boy emperor the colonial governor significantly then charged the Indians that they should not presume to wrong him upon any pretense either by poisoning of him or by other indirect ways.[19] This may be compared with the note by Lawson for the Carolinas, that a chief's heirs were his sister's sons; but that occasionally a ruler would disapprove of his heir apparent; therefore: "Sometimes they poison the heir to make way for another, which is not seldom done, when they do not approve of the youth that is to succeed them. The king himself is generally the chief doctor in this cure." [20]

In explaining their choice of Nattowasso, and of a further desire of heirs, the Indians said that:

> In times past there were two families living at Piscatoway, out of which two families their kings were chosen; the one being the family of Wannys, the other the family of Wahocasso, of which Wahocasso this Nattowasso descended, he being his eldest son as aforesaid. Further, the Indians show that there is a daughter of the family of Wannys now living at Piscataway, and about the same age as this youth now elected by them.[21]

Does the use of Towzin indicate something of the Natchez plan of giving a certain rank to the sons of kings? (On Tayac as the term for "emperor" as distinct from mere "king," see *Jesuit Letters*, p. 125, and *A Relation of Maryland*, 1635, p. 84.)

Since we have, as to inheritance rules, compared the Southeast to the Northwest, we may note something in the Northwest comparable to this giving of title to *sons* of a chief in a matrilineal order. MORICE says of the "Toenezas," or chiefs of the Carrier Indians, whose office descended matrilineally, that "their rank . . . . was shared in *by their children*, who were called "oezkezas."—MORICE, p. 142. (My italics.)

[19] Council of June, 1663, p. 481.

[20] LAWSON: *Carolinas*, p. 318.

[21] Council of June, 1663, p. 481.

They state that they intend to marry these two child representatives of the two regal families, that of Wannas and that of Weghucasso; the boy, a son of a former emperor in the matrilineal line, to the girl, who is apparently a sister of the last emperor, Wannasapapin; the marriage is to be consummated as soon as the children are of "mature years." They also explain here that they intend to change the name of Nattowasso to Weghucasso, "after his father's name." The governor postponed his decision "concerning *the uniting of these two families.*"

At the council in which eventually, seven years later, we hear of the death of the boy emperor, Nattowasso, we hear, incidentally, facts which indicate clearly that the king of Nanjemaick has been succeeded by his own son, one Necutahainon, suggesting that inheritance was tending toward the patrilineal even among the kingly offices of the tribes, as well as in the office of overlord or emperor.

NOTES ON SYNONYMY

NANGEMAICK appears sometimes as Nangemy, and Nangenaick; ANACOSTIA, as Analostan, Anacostaub, Nacostanck, Nacochtank, Nacostines, and Nazatica; SACAYO, as Zachaiah; POTOPACO, as Portobacco, Portobackes; CHINGWAWATAICK, as Chingwaters, Chingwawaters, Chingweatyke; PISCATAWAY, as Pascatoe. The PISCATAWAY were also known by a name of different root, spelled or transliterated variously as Ganawagas, Ganaweses, Kanawhas, and Conoys.

In early days under the emperor Kittamaqund the Piscataway village was, by the English, called, after him, Kittamaqundi. At the same time the emperor's name was sometimes spelled by some of the English, Chitomachen. Chitomachen and Kittamaqundi are the same Algonkian name transliterated differently. Brinton thought erroneously that Chitomachen was a personal name, the name of the emperor, and Kittamaqund was a place name, the name of the Piscatoway capital. Translating the two names into English, after "discovering" the Algonkian roots behind them, he got two remarkably different translations! This is a warning against reckless translation of Algonkian words which have been hopelessly corrupted in English transliteration; local historical enthusiasts should take notice.

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PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

BIOLOGICAL SOCIETY

686TH MEETING

The 686th meeting of the Biological Society was held at the Cosmos Club January 16, 1926 at 8 p.m., with President OBERHOLSER in the chair and 103 persons present. The President announced the membership of the following committees: *Committee on Publications*, C. W. RICHMOND, CHAIRMAN, J. H. RILEY, G. S. MILLER, JR.; *Committee on Communications*, W. R. MAXON, CHAIRMAN, S. A. ROHWER, V. BAILEY. The President referred to the recent death of W. E. SAFFORD and to his many services to the Society.

O. J. MURIE, Biological Survey: *On the trail of the big brown bear in Alaska.*—Two species of bear, *Ursus gyas* and *Ursus kidderi*, inhabit the Alaska Peninsula throughout its length and are also plentiful on Unimak Island, which is separated from the mainland by a narrow strait. *Ursus gyas* is probably the largest of the brown bears, with the possible exception of the form on Kodiak Island. Hence this is the largest carnivorous mammal in the world. The Aleutian Range, which follows closely the Pacific side of the Peninsula, is the natural home of this bear, the lava beds and other rugged portions of the mountains furnishing ideal retreats for hibernation in the winter. The bears emerge from winter quarters probably in the latter part of April or the first part of May and spend the spring season high in the mountains, where they feed largely on grass, roots, and ground squirrels. They appear to prefer the lofty ledges and snow patches on which to lie and doze during the day. Late in June they begin to go to the lowlands and in July are found congregated about the salmon streams where these fish are coming up to spawn. During the summer the salmon form an important item on their bill of fare. In going to and from favorite feeding places the bears have worn deep trails across the tundra and over the marshes. These are interesting indications of the presence of the bears and are often used by travelers. (*Author's abstract.*)—The subject was discussed by C. H. MERRIAM, who mentioned Dr. T. H. BEAN's experience with these bears in Alaska; also by C. W. STILES, who spoke of a form of pernicious anaemia occurring in man from the eating of salmon. A very similar disease is found in the bear, and it is possible that the bear acts as a reservoir for the germs of this disease.

C. E. CHAMBLISS, Bureau of Plant Industry: *An unused southern wild food plant.*—There is a large acreage of wild rice (*Zizania palustris*) on the Atlantic Coastal Plain which supplies food for millions of wild ducks and many other marsh-loving birds. In this area this grass grows on the mud flats and low marsh land that border the tidal streams above brackish water. The seed of this plant should be gathered by the seedsmen of these southern States to supply the needs of the southern hunter, who at present can obtain seed only of the northern species of wild rice (*Zizania aquatica*). The hunter buys this seed at 80 cents per pound to sow in localities remote from tidal marshes to attract wild ducks and to supply them with one of their favorite foods. The northern species matures too early in the southern states to serve as shelter for game birds, and in this section it is also less productive than the southern species.

Besides supplying food for our game birds, this southern wild plant should also be used as a source of food for man. The aborigines of the Coastal Plain of the South Atlantic States probably never used this plant, or the value of wild rice seed as a food would have been brought to the attention of the early explorers to this coast, as it was to the first Europeans who went into the region of the upper Mississippi Valley. Here the white man found that among certain Indian tribes the seed of *Zizania aquatica* was one of the principal articles of diet. We are today indebted to the descendants of these Indians for the nutritious and very palatable parched wild rice that is obtainable from our leading grocers and for the seed that is sought by hunters in every section of the United States. (*Author's abstract.*)

J. W. GIDLEY, National Museum: *Fossil man associated with the mammoth in Florida: New evidence of the antiquity of man in America.*—The published reviews and opinions expressed by various authorities regarding the discoveries, a few years ago near Vero, Florida, reported by Dr. E. H. SELLARDS, were reviewed. These show a wide difference of opinion between the anthropologists and paleontologists regarding the contemporaniety of early man with a Pleistocene fauna in Florida, the former believing that the association of material as reported by Sellards is an unnatural one. Discoveries near Melbourne, about 40 miles north of Vero, made by the Amherst-Smithsonian Expedition of last summer seem to refute this, and to confirm in general Sellard's views regarding the general geology of the region and of the association of remains of man with those of a Pleistocene fauna, which he considered a natural one. Three important localities were examined in the Melbourne district, all showing similar conditions of deposition and geologic position. The Vero district was also revisited. The general conclusions reached as a result of the Amherst-Smithsonian Expedition are that the human remains located belong to the geologic levels in which they were found, and are not the result of later inclusions from the surface through human burials or otherwise; that the human bones and artifacts represent a people contemporaneous with the mammoths and mastodons with whose remains they were found associated, but that the general geologic conditions as interpreted suggest a relatively recent date, either late Pleistocene or even post-Pleistocene, for the extinction of the last survivor of the Pleistocene fauna in the south. (*Author's abstract.*)—The subject was discussed by N. M. JUDD, who stated that the human remains described cannot be more than 2,000 years old, basing his remarks on the similarity existing between these remains and those known from the Mississippi Valley. C. H. MERRIAM considered that the evidence now available made it clear that man was in existence in Florida in the Pleistocene, or else that the mammoth and associated mammals lived on into the present age.

687TH MEETING

The 687th meeting was held at the Cosmos Club January 30, 1926 at 8:10 p.m., with President OBERHOLSER in the chair and 106 persons present. New members elected: W. H. BALL, H. L. STODDARD.

T. S. PALMER made an announcement of the Sixth International Ornithological Congress, to be held at Copenhagen May 24–29. This is the first held since 1910.

HERBERT W. BRANDT, Cleveland: *A naturalist in Alaska* (illustrated).—With representatives of the Biological Survey and the Field Museum, the speaker spent the spring of 1925 in Alaska in the study of the native birds and mammals. Leaving Nenana on March 21, they travelled 800 miles by dog team down the Yukon and established headquarters at Hooper Bay in late April, after 40 days' travel. The Esquimaux of that region are a very primitive race, having almost no contact with whites. Their clothing is made entirely from the skins of birds, and they subsist on fish, birds and eggs, and seal. They are very fond of tea and tobacco. They are very accurate observers of birds, and base their names for them almost entirely on their calls and songs.

About the middle of May the snow began to disappear, and soon spring arrived, heralded by the geese. The first eggs (those of Western Sandpiper) were found on May 26, and soon birds were nesting freely. Birds were abundant, and all those collected were very fat. Many sing on the wing, but the song period is short, lasting only a week or 10 days. The different groups of birds observed—geese, ducks, sandpipers, plover, cranes, ptarmigan, jaegers, gulls, and others—were described and illustrated by colored slides. It was a "lemming year," and snowy owls remained to feed upon them and nest. They lay 6 to 9 eggs, at intervals of 2 or 3 days, and begin to incubate at once, so that the young in a nest present all stages of growth. The earliest nester is the Alaskan Jay, which lays from February to April, when the temperature is far below zero.

A. S. HITCHCOCK, Bureau of Plant Industry: *The grasses of Alaska: their distribution and relationship* (illustrated).—Alaska has four main physiographic areas: (1) The forested area of southeastern Alaska, which extends along the coast about to Kodiak Island, characterized by high rainfall and moderate temperatures; (2) interior Alaska including the valley of the Yukon and its tributaries west to the Yukon delta, characterized by sparse rainfall, extremes of temperature and rather open forests on the lower land; (3) the treeless region of west Alaska, including the Alaska Peninsula and the Aleutian Islands and most of the Seward Peninsula, consisting on the lower levels mostly of tundra; and (4) Arctic Alaska, including the drainage into the Arctic Ocean.

Many species of grasses have a wide distribution outside of Alaska. Several Arctic species are circumpolar; the species of southeast Alaska often extend south to the Puget Sound region; the species of the interior extend over Canada and southward in the Rocky Mountains. Several species found in the lowlands of Alaska extend southward in the mountains and in the United States are alpine plants. *Trisetum spicatum* is common near sea level in Alaska and the circumpolar area, but as an alpine plant extends southward in the mountains through North America into the high Andes, and finally in Terra del Fuego descends to the lowlands again; in the eastern hemisphere it extends south to the Himalayas, Tasmania, and the Antarctic regions. *Calamagrostis canadensis* is a common marsh species in the northern United States; in Alaska it is the dominant grass of the interior. As in all northern

countries the grasses are chiefly of the tribes *Festuceae, Agrostideae, Aveneae,* and *Hordeae;* while the great tribes *Paniceae, Andropogoneae,* and *Chlorideae* are not represented or scarcely so.

An anomalous case of distribution is shown by *Sphenopholis obtusata,* which is abundant around Tanana Hot Springs below Fairbanks. Here is an area of several acres where the soil is kept warm by numerous hot springs. At this spot are found many plants of regions far to the south and not otherwise known from Alaska. The nearest known locality for the grass mentioned, south British Columbia, is about 1500 miles to the southeast. (*Author's abstract.*)

688TH MEETING

The 688th regular meeting of the Biological Society was held at the Cosmos Club February 13, 1926 at 8:05 p.m., with President OBERHOLSER in the chair and 63 persons present. New member: F. A. VARRELMAN.

A. WETMORE reported that the long-eared owl which was common 30 or 40 years ago is now rare in this vicinity. In company with Messrs. McAtee and Preble, he found a dead bird near here about five years ago. A specimen collected in January of this year by E. B. Marshall of Laurel has recently been sent to the Museum. This bird collects in small bands in the winter, and is decidedly unsuspicious. Its growing scarcity is no doubt due to its being shot by hunters.

A. S. HITCHCOCK gave an account of the life of Aimé Bonpland, who accompanied HUMBOLDT on his South American and Mexican trip.

C. W. STILES and M. B. ORLEMAN, U. S. Public Health Service: *An attempt to untangle man and the higher apes.*—The nomenclature of Man, the African Chimpanzees, the Malayan Orang-utans, the Barbary Ape, and the Macaques, is an extremely confused status, not only in general literature but also (except for *Homo sapiens*) in that of systematic mammalogy, medical zoology, bacteriology, and public health. Specialists in mammalogy have referred the complications to the International Commission on Zoological Nomenclature for special action under "Suspension of the Rules," but the data submitted were not complete. The present article reviews the subject from 1551 to date, and the conclusion is reached that the premises present not only a very confused condition in systematic zoology but also one which potentially involves the loss of human life because of the danger of erroneous application of experimental data in bacteriological and serological literature.

According to our interpretation of the International Rules: (a) the correct specific name of the chimpanzee is *satyrus* Linn., 1758; (b) under one interpretation *Simia* 1758 is the correct generic name for the chimpanzee, while *Macaca* 1799 is the generic name for the Barbary ape, and *Silenus* 1820 is the generic name for the macaques (not including the Barbary ape); (c) under another interpretation, *Simia* 1758 should be used for the Barbary ape, while the chimpanzee should be known either as *Theranthropus* 1828 (a sale catalogue name) or as *Chimpansee* 1831; (d) *Pongo pygmaeus* 1760 is the correct name for the Malayan orang-utan now usually known as *Simia satyrus.*

Obviously, the case must be reopened by the International Commission to decide between (b) and (c) at least.

The confusion of *Simia, Simia satyrus,* and *Pithecus,* is so extreme in systematic zoology and in medical publications that we despair of any outlook to make their use uniform and we are persuaded that zoologists should not assume the responsibility for what might result in bacteriological, serological, and public health work, if these cases are judged solely as questions

to be settled under the Law of Priority. We agree with specialists in mammalogy that an application of the rules will "produce greater confusion than uniformity," but we hold that the proposition advanced by the mammalogists would result in preserving ambiguous names and would not meet the desiderata for public health laboratories.

We offer an alternative proposition which appears to us to obviate all chances of ambiguity, namely, that (1–5) under the "Plenary Power" lodged in the International Commission—

1. The technical systematic names *Simia, Simia satyrus,* and *Pithecus* be declared suppressed and as eliminated from further use in connection with any genus or species in zoology;

2. *Theranthropus* 1828 be suppressed, because of inevitable difference of opinion as to its availability;

3. *Chimpansee* 1831 be adopted as official generic name for the African Chimpanzees, and the name be included in the "Official List."

4. The specific name *chimpanse* 1856 be declared type species of *Chimpansee* 1831,—thus giving a tautonymic combination similar to *Gorilla gorilla.*

5. The generic name *Macaca* 1799, type *inuus* = *sylvanus* 1758, be declared valid and be inserted in the Official List of Generic Names.

6. Finally, that the generic name *Pongo* 1799, type *borneo* = *pygmaeus* 1760, be inserted in the list of Official Names as correct name for the Malayan orang-utans under the Rules.

In analyzing the causes of the confusion in zoological nomenclature, the primary and most important factor, in our opinion, is the lack of proper instruction in the principles and practices of nomenclature (i.e., the Grammar of Science). Students too often have to flounder around amid a chaos of technical names without being told why these names are used or how to use them. The remedy consists in teaching the Grammar of Science to persons who later have to speak and write the Language of Science. (*Author's abstract.*)—Discussed by C. H. MERRIAM and T. S. PALMER.

E. R. KALMBACH, Biological Survey: *Blackbirds vs. rice in Louisiana.*—This paper reviews a season's work devoted to a study of an interesting problem in economic ornithology. Blackbirds, particularly *Agelaius phoeniceus* subsp. and *Megaquiscalus m. macrourus,* exact a more or less regular annual toll from the rice grower situated near the southern border of the rice area. This damage often becomes serious for farmers close to the coastal marshes, necessitating protective or control measures. Work carried out from the end of April to the end of September indicated that successful control work could not be carried out during that period of food abundance. Additional work is planned for March and April of this year when better results against the troublesome local race of blackbirds is expected. Migrants from the north, present on the Gulf Coast in great numbers during late fall and winter, do not enter so forcibly into the problem of rice damage, which is most pronounced during the "milk" and "dough" stages of the crop. (*Author's abstract.*)

689TH MEETING

The 689th meeting was held at the Cosmos Club on February 27, 1926 at 8:10 p.m., with President OBERHOLSER in the chair and 53 persons present. New members elected: STUART T. DANFORTH, F. C. HOTTES, PAUL H. OEHSER.

The Secretary read the report of the Committee on Constitution and By-

laws, to be acted on by the Society four weeks later. The report was discussed by the President.

C. W. GILMORE, National Museum: *Remarks on fossil tracks from the Grand Canyon* (illustrated).—The speaker described a trip to the Grand Canyon, Arizona, undertaken for the duel purpose of securing a collection of fossil tracks for the U. S. National Museum, and of preparing an exhibit of the tracks *in situ* for the National Park Service. The tracks occur in the Coconino sandstone (Permian), at a level more than 1,000 feet below the present rim of the Canyon wall, where the famous Hermit trail crosses the sandstone on its descent into Hermit Basin. Both of the above-mentioned projects were successfully carried out, a collection of slabs of footprints some 1.700 pounds in weight was secured for the National collections, and a track-covered area several hundred square feet in extent was uncovered by the side of the trail to form a permanent exhibit of the tracks as they occur in nature. It was pointed out that all of these tracks are found on the inclined surface which make up the strong cross-bedding of the sandstone, and that with one exception all of the hundreds of tracks and trails observed were headed up the slope. No satisfactory explanation of this fact has yet been obtained. It was pointed out that the Ichnite fauna of the Coconino sandstone as now known consists of 8 genera and 10 species, representing both vertebrate and invertebrate animals. All of the vertebrates were quadrupedal in gait, and all were relatively small, probably representing the two classes Reptilia and Amphibia. No skeletal remains have yet been found in the Coconino sandstone, consequently no direct evidence can be offered as to the makers of any of these tracks. (*Author's abstract.*)

Discussed by DAVID WHITE, who referred to the recent calculations of the age of the earth based on the rate of atomic disintegration of radio active minerals. According to these calculations, the age of Permian deposits is put at 450,000,000 to 600,000,000 years and of some Precambrian rocks at 1,500,000,000 years.

WALDO L. SCHMIDT, National Museum: *Col'ecting invertebrates in South America* (illustrated).—The speaker spent six months, from August, 1925, to January, 1926, in a field study of the South American crustacean fauna, under the Walter Rathbone Bacon Scholarship administered by the Smithsonian Institution. This bequest was made by the late Mrs. VIRGINIA PURDY BACON, of Detroit, in memory of her son to enable studies to be made of the fauna of countries other than the United States.

Nearly three months were spent collecting along the Brazilian coast, in the vicinity of Rio de Janeiro and southward. Stations were established at Santos, Ilha São Sebastião, where in company with Dr. H. LUEDERWALDT of the Museu Paulista at São Paulo, a most profitable ten days field work was spent, Paranaguá, São Francisco and Florianopolis. One trip was made inland to Castro, in the State of Paraná, for the purpose of obtaining specimens of a carcinological rarity, *Aeglea intermedia*, which here was found to occur in great abundance. Blumenau in the State of Santa Catharina, long the home of Fritz Mueller, was also visited. Here are yet to be found the "primitive" microscopes with which he made all of his wonderful microscopic observations. At the Museu Paulista, in São Paulo, their very considerable and valuable collection of unidentified crustacea was lent for further laboratory study in Washington. The collections of the Brazilian National Museum were examined while at Rio de Janeiro.

In Uruguay about seven weeks were spent, chiefly at Montevideo, and in trips with the steam trawlers working out of that port. Calls were made at

Puerto La Paloma, Maldonado, and Barro de Santa Lucia. At Montevideo, the Instituto de Pesca maintains a well equipped fisheries laboratory. The National Museum, in view of the wealth of that country, where the American dollar is at a discount, should have a new independent building instead of being housed in a portion of the Teatro Solis building.

At Buenos Aires the first year's field work was brought to conclusion with an examination of the extensive crustacean collections here brought together by the Buenos Aires Museum. Permission was granted to take a selected series back to Washington. The excellence of the collections of these forms is in a measure due to a system of subsidizing fishermen, and providing them with suitable collecting kits. A visit was also paid to the famous museum at La Plata where, in addition to their marvelous exhibit of fossil vertebrates, other zoological collections are maintained. Here too, the carcinological collections were most generously tendered for study in Washington. (*Author's abstract.*)

S. F. BLAKE, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

Dr. JOHANNES SCHMIDT, Director of the Carlsberg Physiological Laboratory will give an address under the joint auspices of the ACADEMY, the Smithsonian Institution, the Carnegie Institution, and the Biological Society at the National Museum on Friday, June 4, on the *Danish oceanographical expeditions: eel investigations.* The address will be illustrated by film and lantern slides.

At a meeting of the American Institute of Chemists, held in New York on May 8, Dr. WILLIAM BLUM of the Bureau of Standards was awarded the Institute's first annual medal for "Distinguished Service in Governmental Work." Dr. C. E. MUNROE made the presentation address. Dr. BLUM responded with an address on *Science for humanity's sake.*

Professor H. H. BARTLETT, Director of the Botanical Garden of the University of Michigan, visited the Grass Herbarium to identify some fragments of grasses and other economic plants excavated from Graeco-Roman sites in Egypt by Professor A. E. BOAK, of the University of Michigan. Professor BARTLETT has been appointed honorary collaborator of the Smithsonian Institution and will collect in Formosa and Sumatra on behalf of the two institutions mentioned.